Dose Calculations

Dr. Narin Ozturk

Department of Pharmacology

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Oral tablet dose

- A drug at a dose of 100mg is prescribed for oral use in a hospitalized person (in patient). There is only a 25 mg-tablet form of this drug in the hospital pharmacy.

- How is this drug administered to the patient?
- If 1 tablet includes 25 mg,

  x tablet include 100 mg

X = 4 tablet / dose

Oral tablet dose

- A patient who is diagnosed with hypertension has been prescribed a drug at a dose of 12.5 mg for daily use. The tablet containing this drug is at 25 mg-dose in the pharmacy. How is this drug administered to the patient?

- If 1 tablet includes 25mg
  x tablet include 12,5 mg

- X= ½ tablet

- How is this tablet applied?????

Divisible Tablets

Oral tablet doz

- 0.4 g is precribed; Tablet form is 200 mg/tablet in the pharmacy
- 0.4 gram

  0.4 x 1000= 400 mg

- If 1 tablet include 200 mg,

  x tablet include 400 mg

X= 2 tablet

Oral Liquid Dose

- A 250 mg dose of syrup is prescribed for use in children twice daily. There is 30 ml of preparation containing 100 mg (100 mg/ml) active substance in 1 ml in the pharmacy. How is the dose administered to the patient?

If 1 ml include 100 mg active substance,

X ml include 250 mg active substance

X= 2,5 ml syrup

If 1 spoon is 5 ml, then syrup is applied in a half spoon.

How many days later will 30 ml syrup be finished?

6 days

Drug Dose Measures

- When your doctor says 1- scale, it means that the amount is 5 ml.

- 1 sweet spoon = 5 ml (Full scale)
- 1 tea spoon = 2,5 ml (Half scale)
- 1 soup spoon = 15 ml

- 1 ml = 20 drops
- 0,5 ml = 10 drops
- 1,5 ml = 30 drops

Dose Calculations According to Body weight and Body Surface Area

Calculation of the Body Surface Area (BSA m^2)

Mosteller formula

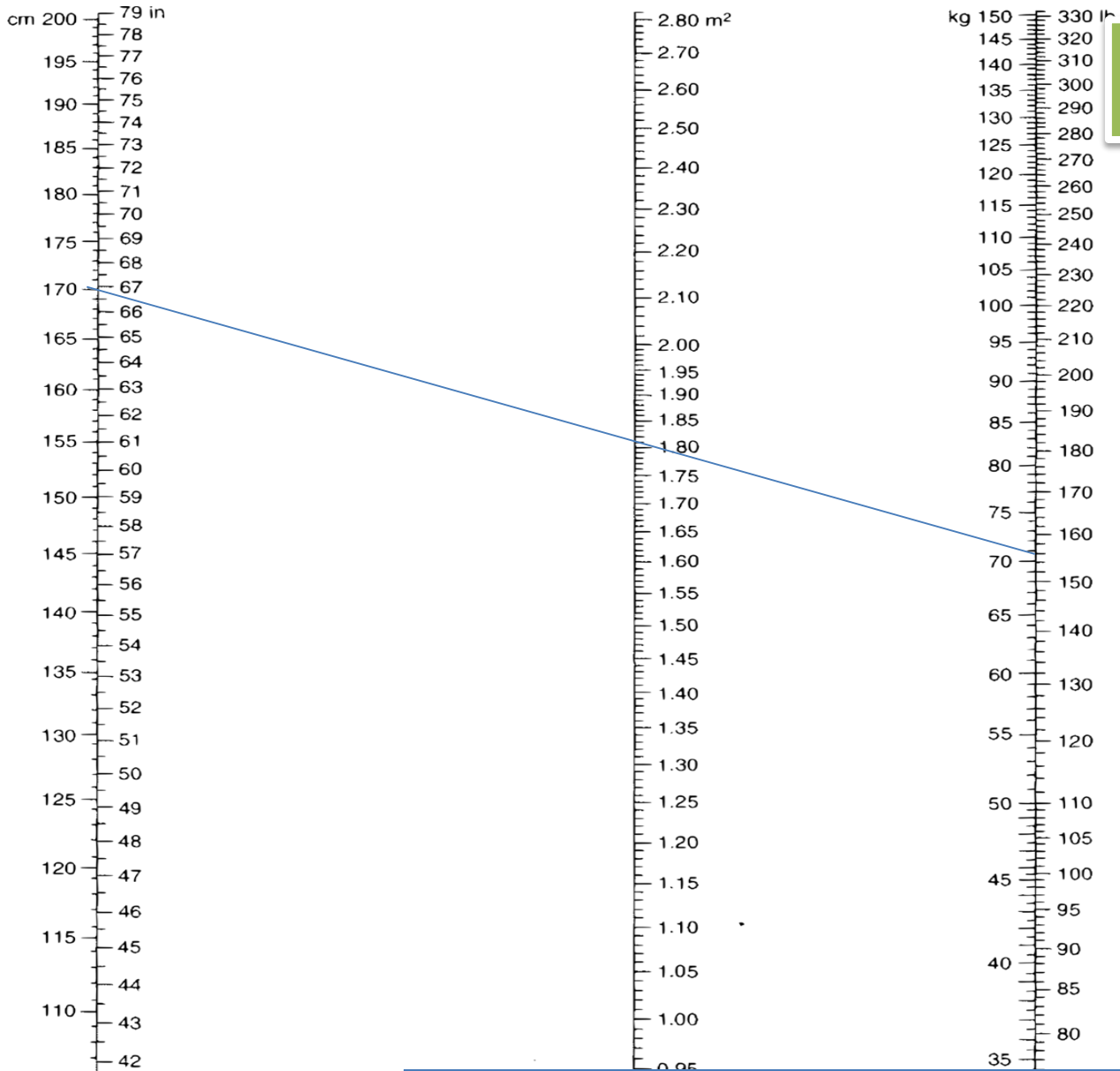
$$BSA = \sqrt{\frac{\text{Height (cm)} \times \text{Weight (kg)}}{3600}}$$

- **In special conditions, it is calculated according to ideal body weight.**
- **In obese patients, dose is determined according to protocol writen by the doctor and to the performance of the patient.**

Mean values of BSA:

Male: 1,9 m^2

Female: 1,6 m^2



Calculation of Body Surface Area

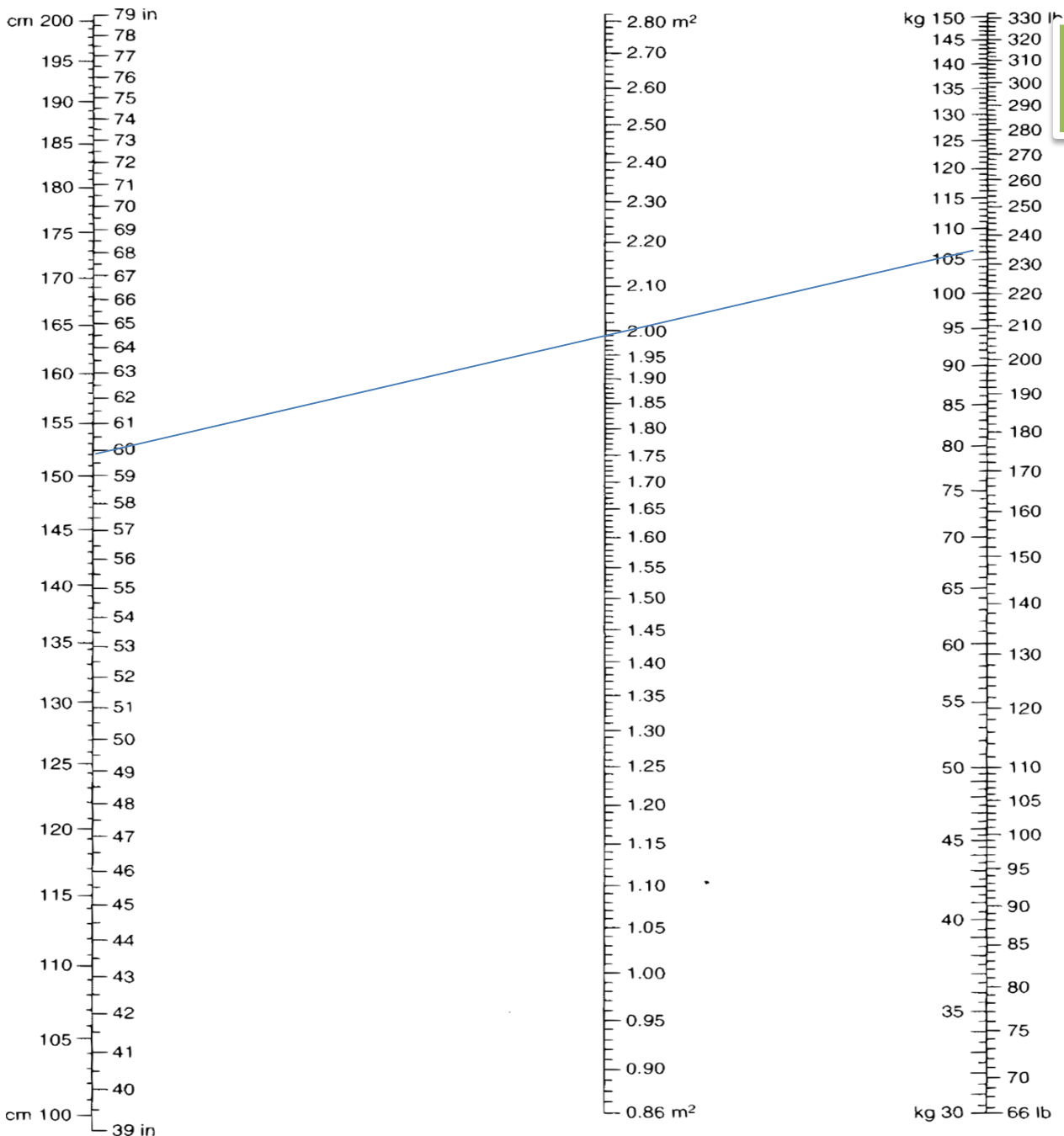
It is prepared according to Nomogram Dubois & Dubois formula.

BSA (m^2) = 0.007184 x weight $kg^{0.425}$ x height $cm^{0.725}$

- **50 mg/m^2 dose of doxorubicin and 25 mg/kg dose of cyclophosphamide were prescribed to a 36-year-old woman diagnosed with breast cancer.**

- **The weight of the patient is 152 cm, and body weight is 106 kg.**

- **Calculate the body surface area of the patient.**
- **Calculate the doses of the drugs to be administered to the patient.**



Calculation of Body Surface Area

BSA= 2 m^2

- **50 mg/m^2 dose of doxorubicin and 25 mg/kg dose of cyclophosphamide were prescribed to a 36-year-old woman diagnosed with breast cancer.**

- **The weight of the patient is 152 cm, and body weight is 106 kg.**

- **BSA= 2 m^2**

- **Doxorubicin dose calculation:**

  1 m^2 50 mg

  2 m^2 X

X= 100 mg doxorubicin

- **Cyclophosphamide dose calculation:**

1 kg 25 mg

106 kg X

X= 2650 mg cyclophosphamide

Special Dose Calculation
CARBOPLATIN

- **Dose = AUC × (GFR + 25)**
- Dose = Total dose (mg)
- AUC = targeted AUC (mg/mL × min)
- GFR = Glomerular Filtration Rate*
- 25 = Mean non-renal clearance in adults

$$\text{Glomerular filtration rate (mL/min)} = \frac{N \times (140 - \text{age}) \times \text{weight (kg)}}{\text{Serum creatinine (µmol/L)}}$$

N=1.04 for women
N=1.23 for men

Targeted AUC of 4 to 6 mg/mL*min

The solution may be diluted with 5% dextrose or 0.9% sodium chloride for injection.

- **100mL or 250mL, 15-60 min i.v. infusion**
- **The set containing Aluminum should not be used with needle or syringe**
- **Drug should be protected from the light**
- **Stable for 8 hours after preparation**

Special Dose Calculation
CARBOPLATIN

- AUC 6 mg/mL*min
- GFR (ml/dak)= 40 ml/min
- Dose = AUC × (GFR + 25)
- Dose = 6 mg/ml.min x (40 ml/min +25)
  = 390 mg (Attention: Dose is in terms of mg)

390 mg carboplatin will be given in 100 ml of 5% dextrose;

If ;	45 ml	contain	450 mg carboplatin
	X ml	contain	390 mg

X = 39 ml is taken from the stock and added into a 100 ml infusion bag.

Rx;

1. Epirubicin 65 mg i.v. bolus
2. Fluorouracil 800 mg i.v. bolus
3. Cyclophosphamide 800 mg i.v. 100-250 ml NS 20-60 dak

Height: 165 cm
Weight: 59 kg
BSA: 1.65 m^2

Chemotherapy Dose Control

1. Epirubicin 40 mg/m^2 x 1.65 m^2 = 65 mg IV
2. Fluorouracil 500 mg/m^2 x 1.65 m^2 = 825 mg IV
3. Cyclophosphamide 500 mg/m^2 x 1.65 m^2 = 825 mg IV

Calculated dose may vary by up to 5% of the dose written by the physician.

Preparation of Parenteral Drugs

Rx;

1.	Epirubicin	65 mg i.v. bolus
2.	Fluorouracil	800 mg i.v. bolus
3.	Cyclophosphamide	800 mg i.v. 100-250 ml NS 20-60 min

1 ml	2 mg
32,5 ml	65 mg

1 ml	50 mg
16 ml	800 mg

1 g= 1000 mg
1000 mg/50ml
20 mg/ml

1 g of lyophilized powder is dissolved in 50 ml of solvent in the flask.

20 mg/ml

20 mg	**1 ml**
800 mg	**40 ml**

40 ml of the solution is taken from the flask and added into 250 ml of Ringer isotonic sodium chloride or Dextrose solution.

Continuous Infusion Rate

- The drug dose administered by i.v. infusion at a certain time interval
- **125 ml/hour**
- **1000 ml for 8 hours**
- 10 mg/min
- Drop/min

Amount of drug / Time = Infusion rate

Classical Infusion Rate Method

- Drop Rate Method

20 drop/min

Calculation of flow rate in terms of drop/min :
Amount of Total Liquid X Drop Factor / Total Time (min)

Drop Factor = Number of Drops / 1cc

10, 15, and 20 drop/mL

cc = ml
1 cc = 1ml
1 ml = 20 drop

Classical Infusion Rate Method

- **1000 cc saline should be administered to the patient for 5 hours with intravenous infusion. A serum set with a drop factor of 20 will be used. What should be the drop rate?**

- **Drop Rate= Drop/min**

Calculation of flow rate in terms of drop/min :
Amount of Total Liquid X Drop Factor / Total Time (min)

- **Drop Rate = 1000 cc X 20 drop/cc / 5x60 min**
  = 20000 drop / 300 min
  = 66,6 drop / min
  = 67 drop / min

- **1 liter dextrose solution was administered to a patient at 12:00 at a rate of 50 ml/hour. At what time will the application finished?**

In 1 hour 50 ml will be applied

X 1000 ml

X= 20 hour

The application will be finished at 08.00 a.m. the next morning.

Infusion Pump

Infusion Rate According to Body Weight

- $$\frac{\text{Desired dose (mcg/kg/min) x body weight (kg)}}{\text{Concentration (mcg/ml)}} = \frac{\text{flow rate (ml/h)}}{60}$$

A drug at a dose of 104 ng/kg/min will be administered to a patient weighing 58 kg with an automated infusion pump. The drug was prepared in a dose of 20 mg/100 ml in an infusion bag.

What should be the value of flow rate to enter to the automatic infusion pump in terms of ml/hour?

Drug A: **20 mg/100 ml = 0.2 mg/ml = 200 mcg/ml**

104 ng : 0.104 mcg

0.104 (mcg/kg/min) x 58 / 200 (mcg/ml) = Flow rate (ml/sac) / 60

Flow rate = 1,8 ml/hour

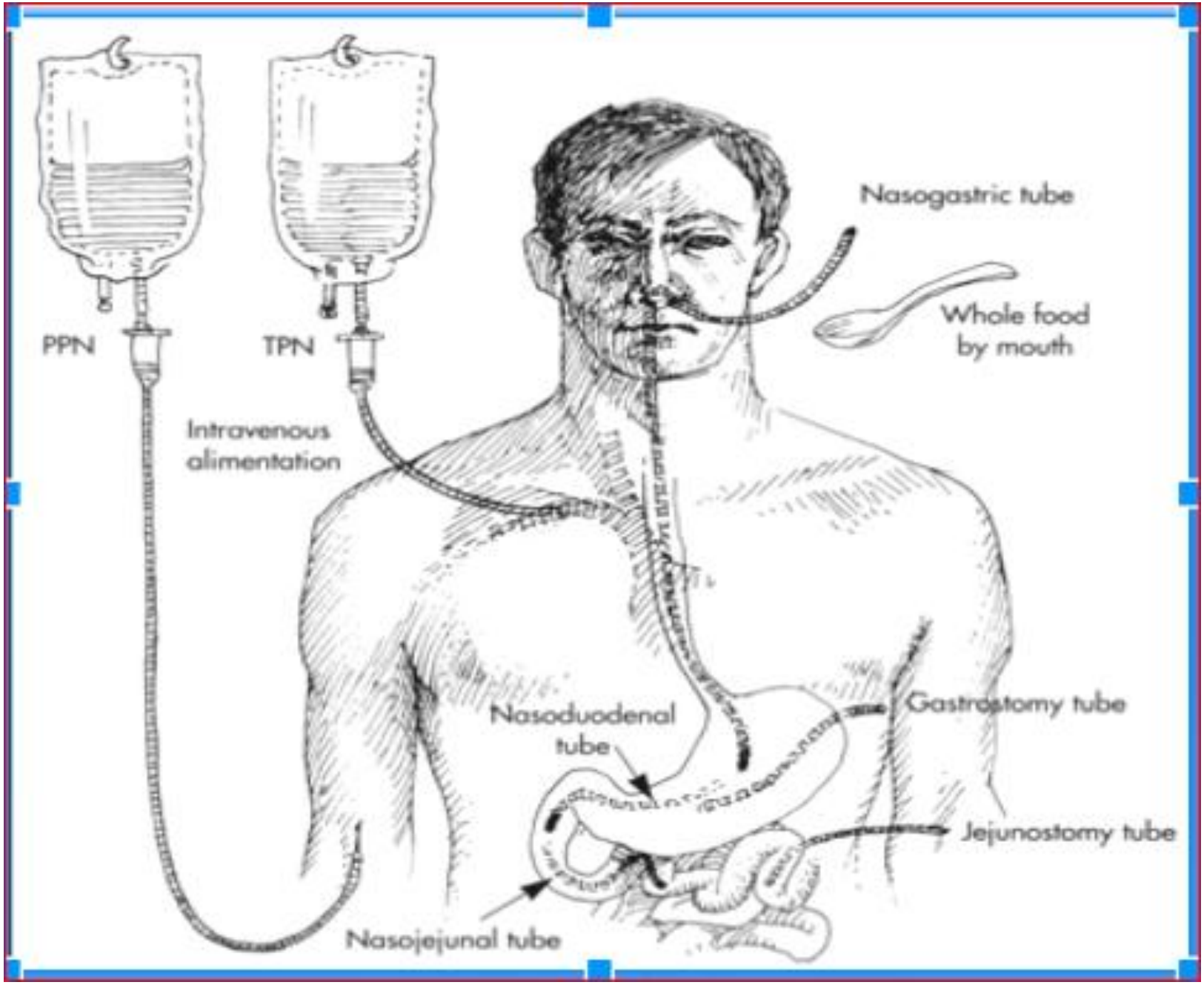
Total Parenteral Nutrition

- Total Parenteral Nutrition (TPN) is the feeding of a person intravenously bypassing the usual process of eating and digestion.

- The person receives nutritional formulae that contain nutrients such as glucose, salts, amino acids, lipids and added vitamins and dietary minerals.

Total Parenteral Nutrition

Examples of total parenteral nutrition solutions[27]			
Substance	Normal patient	High stress	Fluid-restricted
Amino acids	85 g	128 g	75 g
Dextrose	250 g	350 g	250 g
Lipids	100 g	100 g	50 g
Na^+	150 mEq	155 mEq	80 mEq
K^+	80 mEq	80 mEq	40 mEq
Ca^{2+}	360 mg	360 mg	180 mg
Mg^{2+}	240 mg	240 mg	120 mg
Acetate	72 mEq	226 mEq	134 mEq
Cl^-	143 mEq	145 mEq	70 mEq
P	310 mg	465 mg	233 mg
MVI-12	10 mL	10 mL	10 mL
Trace elements	5 mL	5 mL	5 mL


PPN
TPN
Intravenous alimentation
Nasogastric tube
Whole food by mouth
Nasoduodenal tube
Gastrostomy tube
Jejunostomy tube
Nasojejunal tube

- The patient’s water requirement / volume requirement and follow-up
- The need of daily calories (glucose and fat) and protein should be calculated.
- Monitoring of micronutrients such as Na ,K, P, Cl, Mg.
- Daily vitamin and trace element requirements (Se, Fe, Cu, Zn etc.) should be monitored.

Food Energy

- Organisms derive food energy from carbohydrates, fats and proteins in the diet.
- Some diet components that provide little or no food energy, such as water, minerals, vitamins, cholesterol and fiber, may still be necessary to health and survival for other reasons.
- Water, minerals, vitamins, and cholesterol are not broken down (they are used by the body in the form in which they are absorbed) and so cannot be used for energy.
- Fiber cannot be completely digested by most animals, including humans.

Food Energy

- 1 gram of aminoacid gives 4 kcal energy.
- 1 gr dekstrose produces 3.4 kcal.
- 1 gram of fat produces 9 kcal.

Distribution of Calorie

- 60-70% of the calorie is glucose,
- 30-40% of the calorie is fat
- In the case of insulin resistance, the proportion of fat is increased to 50%.

- If the triglycerides increase, the calorie of the glucose is increased.

Preparation of TPN

- **A Total Parenteral Nutrition (TPN) was presribed to a patient for using 16 hours. Prepare at the pharmacy.**

Desired Nutrition

Amino acids	2.125%
Dextrose	20%
Sodium chloride	15 mEq
mg/mL)	
Potassium phosphate	15 mMol
Calcium gluconate	2.5 mEq
MVI 10 mL	
Trace elements	1 mL
Regular insulin	15 units
SWFI qs	1000 mL

Amounts available in the pharmacy

Amino acids	8.5% solution
Dextrose	50% solution
Sodium chloride	14.6% (2.5mEq/mL, 146
Potassium phosphate	3 mMol/mL
Calcium gluconate	%10 (4.65 mEq/10 mL)
MVI	10 mL vial
Trace elements	1 mL vial
Humulin R U-100	(100 units/mL)
Steril water for injection	

Steril water for injection
qs: a sufficient quantity; Quantum satis

20% means 20 gram per 100 ml

20 gr / 100 ml = 20000 mg / 100 ml = 200 mg / ml

MVI 10ML INJECTION

Manufacture	USV (Other Products from USV)
Composition	D-panthenol 2.5 MG+Niacinamide 10 MG+Pyridoxine 1.5 MG+Thiamine 5 MG+Vitamin A 1 000 IU+Vitamin C 50 MG+Vitamin D3 100 IU+Vitamin E 50 MG
Form	INJECTION
Pack Size	1
Delivery	Expected in 4 - 48 HRS
MRP (per pack)	Rs. 18,81 Save upto 15%

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Amino acids

100 ml 2.125 g
1000 ml X
X= 21.25 g

100 ml 8.5 g
X 21.25 g

X= 250 ml from %8.5 amino acid solution

Preparation of TPN

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Calcium gluconate	%10 (4.65 mEq/10 mL)
MVI	10 mL vial
Trace elements	1 mL vial
Humulin R U-100	(100 units/mL)
Steril water for injection	

Steril water for injection
qs: a sufficient quantity; Quantum satis

Dextrose

100 ml 20 g
1000 ml X
X= 200 g

100 ml 50 g
X 200g

X= 400 ml from %50 dextrose solution

Preparation of TPN

- **A Total Parenteral Nutrition (TPN) was presribed to a patient for using 16 hours. Prepare at the pharmacy.**

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Amino acids	2.125%
Dextrose	20%
Sodium chloride	15 mEq
Potassium phosphate	15 mMol
Calcium gluconate	2.5 mEq
MVI 10 mL	
Trace elements	1 mL
Regular insulin	15 units
SWFI qs	1000 mL

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Trace elements	1 mL vial
Humulin R U-100	(100 units/mL)
Steril water for injection	

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qs: a sufficient quantity; Quantum satis

Sodium Chloride

1ml	2,5 mEq
X	15 mEq

X= 6 ml

Potassium phosphate

1 ml	3 mMol
X	15 mMol

X= 5 ml

Calcium gluconate

10 ml	4.65 mEq
X	2.5 mEq

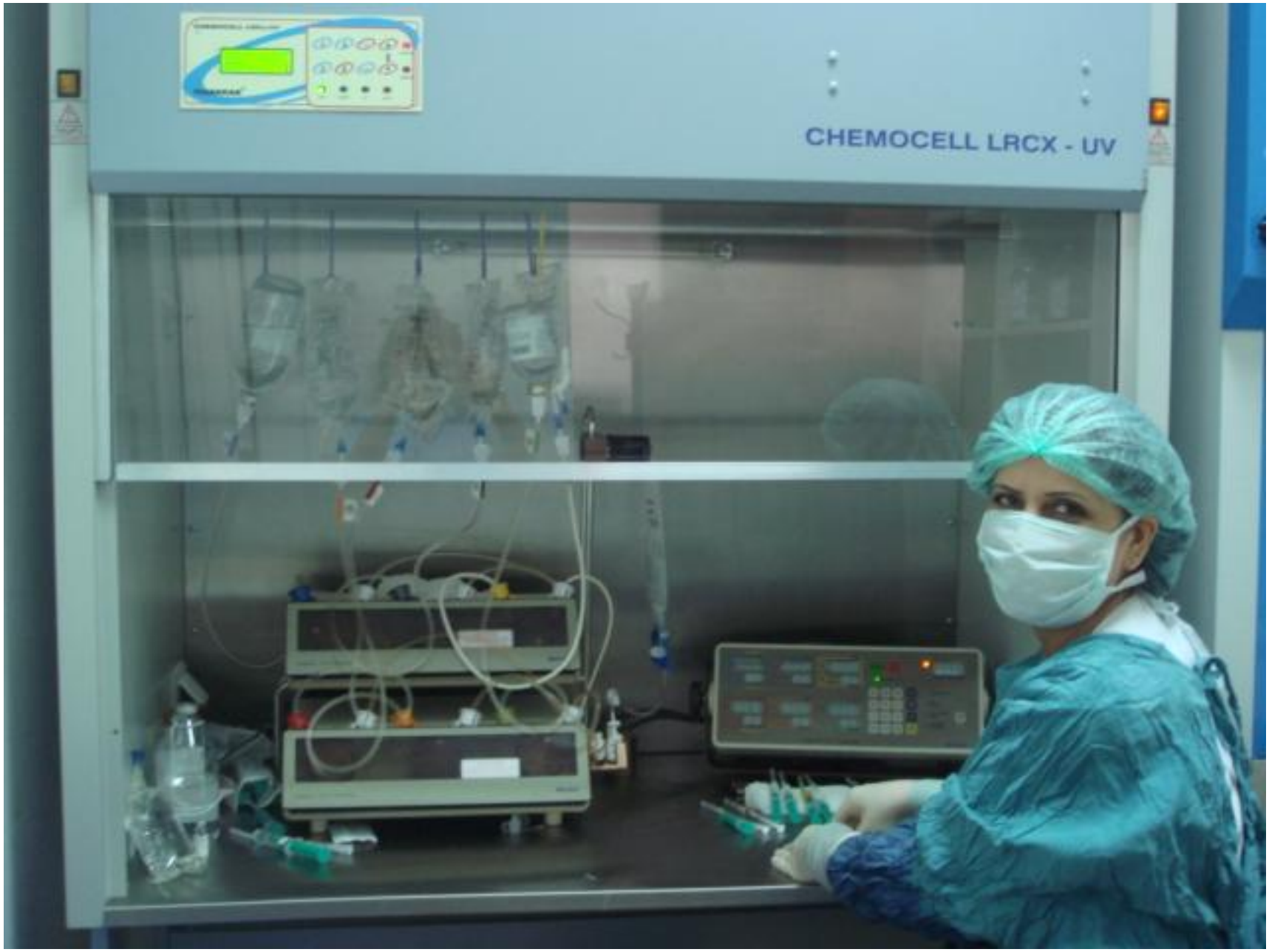
X= 5.4 ml

Insulin

1 ml	100 Units
X	15 Units

X= 0.15 ml

1000 ml – (250 + 400 + 6 + 5 + 5.4 + 0.15 + 10 + 1) = 322.45 ml steril water for injection


CHEMOCELL LRCX - UV

Preparation of TPN / Calculation of Calorie

- **A Total Parenteral Nutrition (TPN) was presribed to a patient for using 16 hours. Prepare at the pharmacy.**

Desired Nutrition

Amino acids	2.125%
Dextrose	20%
Sodium chloride	15 mEq
Potassium phosphate	15 mMol
Calcium gluconate	2.5 mEq
MVI 10 mL	
Trace elements	1 mL
Regular insulin	15 units
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Steril water for injection
qs: a sufficient quantity; Quantum satis

Amino acid
X= 21.25g
21.25g X 4 = 85 kcal

Dextrose
X= 200 g
200g X 3.4 = 680 kcal

1 gram amino acid = 4 kcal
1 gr dextrose = 3.4 kcal
1 gr fat = 9 kcal

85+680= 765 kcal

Daily Calorie Requirement

- In practice, the calorie requirement is 20 kcal/kg
- Start with 25 kcal/kg, and go up to 30 kcal/kg
- Daily protein requirement is 1 g/kg
- Tracutil - Cernevit – Addmel – Soluvit include water and oil soluble vitamins

Question of the day ☺

- A patient with a diagnosis of metastatic breast cancer was prescribed 5-fluorouracil (5-FU) at a dose of 5200 mg for continuous infusion with the pump for 5 days.
- The capacity of the pump is 300 ml, and 5-FU drug form in the pharmacy include 1000 mg/20 ml.
- It should be prepared in dextrose solution.

- **How much (ml) 5-FU and dextrose are needed according to this prescription?**

Question of the day ☺

- **5-FU 5200 mg**
- **Continuous infusion with elastomeric pump for 5 days**
- **(Pump capacityi 300 ml)**
- **Dekstrose 500 ml**
- **Drug from 1000mg/20ml**

20 ml	**1000mg**
X	**5200mg**

X= 104 ml

300 ml - 104 ml= 196 ml dextrose

"Take a few capsules each morning before you weigh yourself. They're filled with helium."